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312 tion ditches because the sand in which they are built is so light that they easily break.

The main ditches are perhaps two to three feet deep; the others are quite shallow. The ditch system is not complex because most fields that are irrigated lie directly under the main ditches; others are fed by a few laterals. Maintenance of the dams and ditches is not a community affair, but devolves on those whose fields are supplied by the particular dam or ditch. They are dilapidated most of the time, being repaired only as needed. This is to be expected because the material is so light as to wash out easily and it would be futile to keep them up when not in use. There is no set regulation for the use of the water. The supply is large, the need is small, and apparently there is little friction over [578] rights to its use. Yet quarrels have arisen from this source.

241 Planting is a family occupation, even the children helping to dig holes. Garcés says:—

592 I had much complacency to see that as soon it was dawn each married man with his wife and grown sons went forth to till his milpas, taking the necessary implements, as hatchets, dibbles (coas), and hoes, all of which they procure from Moqui.[1]

As a rule each family plants as much corn as possible. Corn, beans, and squash are the staples, the year-round food. Corn (*teyă'dj*) is not planted 243 deep; 5 to 7.5 cm. being usual. Straight lines for the rows of hills may be drawn with the foot; their orientation is immaterial. Kneeling, the ●[412] first hole is scratched with the planting stick (*hwdlid*) in the manner of a canoe man wielding his paddle. This is a buckthorn branch (*Condalia lycioides* var. *Canescens* (Gray) Trel.), 2 cm. in diameter, 65 cm. long, with one end cut wedge-shaped.[2] The soil is loosened to a depth of 20 cm. and eight or ten kernels dropped in. Before putting the corn in the first hole, the planter prays:—

[539] mĕdjpák	teyădjmehána	owi
growing	corn good	I do it.

"Grow good: when your stalk grows, grow tall: grow like the mythic corn." Then he drops the kernels into the hole and chewing another, blows t toward the mythic corn, two white marks high on the canyon wall. These represent the two original ears given by the twin culture heroes.[3] Filling the first hole, he takes two short steps forward, kneels, and digs a second, and so on. The second row parallels this

[1] Coues, 345. A later statement (435), that tribes upstream from the Mohave lack crops, must be taken to mean that the Walapai and Havasupai had less than the Mohave.
[114] [2] Cushing, (a), 550, notes the use of a planting stick provided with a footrest, but my informants denied this.
[171] [3] The Zuñi also pray at the first planting (Cushing, (d), 178–179).

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with holes opposite those in the first. (Actually the spacing is not very regular). Thus groups of plants grow about a meter apart in both directions. Fields are irregular in outline. Several men might plant one field, the others following the leader's spacing. They do not repeat the invocation. The land is irrigated about two days before planting. They begin to plant in the middle of April and finish two months later; the precise time depends on a man's whim. If corn is planted in the middle of May the shoots will appear after four days, but later planting requires five days. In a month it is half a meter high; it then receives a second watering. When the tassel appears after two or two and a half months it is given a third and last watering.[1] The attention required by the growing crop is not burdensome; of course the fields must be weeded, traps placed for the ground squirrels and rats who would otherwise uproot the corn, etc. The hoe is a wooden spade-shaped affair with a disproportionately long narrow blade with a handle in the same plane. This is used to scrape up the sand into ridges when irrigating and for scraping out weeds. The shoulder blade of a horse (never a deer) is also used for the latter purpose: this is held in the hands, not hafted. The corn ripens in about four months. Plants bear two and sometimes three ears to the stalk. Only the ears are collected, although the stalk with the ears attached is sometimes taken (for fodder?).

243 221 243 243 [412]

According to Sinyella there were only two varieties of corn before he was married (1860–70), then others were acquired from the Hopi. These two were *teyădĭĭpa*", with kernels mostly red with a little white, and blue corn, both of which, but particularly the first, are accredited to the culture heroes. The modern varieties recognized are white, red, yellow, black, white and red (*n„mawĭghuwălă*), white and blue (*n„mă'vĭgwasú*), all of which are named by color, and black and white (*n„ŭdă*, spotted). A very small variety (*Zea arnylacea*), with ears about 12 cm. long, known as Mohave corn, is also grown, yielding ears in two months. These have been traded from the Mohave through the Walapai. The blue corn is planted first, because it ripens quickly. Each color is planted alone in a field, even in a large field which is given over to several varieties. The colors of adjacent varieties mix, but no reason is offered for this. One color is not preferred above another for its taste, but wafer bread is made of either white or blue, but not of mixed corn. Long, well formed ears are selected for seed. About twenty such are said to be needed to seed an acre, but this does not seem enough.

[177] [439] [177]

[1] Mr. Gensler, a first-rate farmer, tells me that this system of irrigation is proper; corn planted in late May matures in sixty to seventy-five days.

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away and the seeds scraped out and collected. After further drying, the flesh is sliced spirally from side to side, beginning at the stem end, in a strip 2.5 to 5 cm. in width. This coil, 1 to 1.5 m. long, is hung from a pole to dry in the sun. While it is still pliable, it is folded back and forth on itself into a bundle (*hamtekwi'lkwa*), 30 to 45 cm. long, and bound with one end of the strip. This is set aside to dry thoroughly before it is placed in the storehouse for winter use. Squash so dried will keep through an entire year. Melons are also grown. 251

Sunflowers (*dk'ŏta*) are grown for their seed. Cotton (*Gossypium hopi* Lewton) is raised from seed obtained from the Hopi; the only use for this product is in the strike-a-light. The seeds of wild food plants are not planted; some, such as pigweed, grow in the fields. Peaches and figs, modern foodstuffs, are eaten fresh. Peaches are also torn in two and pitted, while figs are opened, before they are spread on the rocks to dry. 241 [249] [372] [251]

Two varieties of tobacco are known, *úxa*, and *kaθθ'dn„lu'va* (Coyote's tobacco; *Nicotiana trigonophylla* Dunal). Myth has it that the second was grown by Coyote for his own use. Both grow wild on the plateau and in the canyon above the village: their leaves are similar, but the smoke tastes somewhat differently, according to the natives. Tobacco (both varieties?) is grown only on the plateau. A mesquite tree is cut down and burned. The tobacco seeds are thrown into the dead ashes (the soil is not dug up). Willow is not used as a substitute. 249

Wild Food Products

These are a valuable adjunct to the food supply, especially from the autumn until spring during the residence on the plateau. During this period they lead a wandering life, families going off in the fall to a place where someone had reported piñon nuts lying plentifully on the ground; winter finds them to the east, hunting in the Coconino Basin, dropping down to the benches of the Grand Canyon in the spring for mescal, and so on. Women and children are sometimes left to gather seeds while the men go off to trade. 221 222 [462]

Mescal (the agave plant), which grows on the canyon benches, is ripe in May when the flower stalk is 30 to 60 cm. tall. The plant is severed entire by pounding a chisel-shaped buckthorn stick (*tŏp'ŏ'l*) about 1 m. long, 3 cm. diameter, against its base. The outside leaves of the inverted plant are trimmed of their green portion with a special hatchet (*dgwidja*). This consists of a broad stone blade set in a slot midway in the length of a short handle, 30 cm. long, (sometimes of piñon wood), where it is held fast with glue or pitch and by lashings. A load of [412] [412] 252

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with tongs, rolled about on the ground with a bundle of brush, and finally rubbed individually with a rag to remove the spines completely. A burden basket full is carried home, the fruits opened and spread out to dry; sometimes the seeds are removed. When desired these are soaked for a few hours and squeezed to make a sweet decoction. 222 252 251

Mormon tea furnishes a drink: the stems are dried in bundles. [272]

Mesquite pods (*iyd'a*) are ripe at the end of September. There is but one way to prepare them. They are gathered when dry and pounded on the grinding slab. The excessively hard seeds are winnowed from the ground pod. The latter is stirred into cold water and allowed to stand for several hours. This drink is stirred before it is imbibed. The pods, being sweet when dry, are often chewed at odd times.

Yucca fruit (*dmõnõ't*) ripens on the plateau at the end of September. A layer of this is spread on a bed of dry sticks, a meter in diameter. The sticks are fired until the rind of the fruit is burned black, when they are removed with the tongs (*sdtdo'*), and thrown into a pile, on which water is sprinkled. The burned rind is removed, and the seeds, separated from the pulp, prepared by mashing with a mano. The flesh is spread to dry in a layer, 1 cm. thick, on a carpet of Mormon tea sprigs: this sheet is folded for storage. All drying fruits will spoil if exposed to rain. This preparation will keep for half a year. Bits of the sheet are broken off to eat dry, or they may be boiled.

A variety of seeds are gathered: a partial list includes pigweed (*dgwodvł*); goosefoot (*tkciyddidj*); *sllł''ł, gõtd, i'łdł* (all three unidentified): juniper berries (*ddjwqd*), and piñon nuts. Sprays of ripe pigweed and goosefoot are allowed to dry for a week; the pods are then rubbed between the palms into a tray basket so that the seeds may be winnowed. These are roasted in the parching tray and ground. Half a kettle of water is brought nearly to a boil and the meal stirred in to make a mush. Pigweed leaves are boiled with salt, sometimes with cornmeal added, and eaten like cabbage.

Sllł''ł grows only in open glades on the highest part of the plateau. The harvester walks along with a small burden basket in her left hand into which she raps the seeds with a seed beater (*sllł'dridł; dridł*, to beat), emptying the smaller into a larger burden basket on her back from time to time. The seeds are ground, although they are unripe, and stirred into boiling water to make a thin gruel. They are sometimes parched, ground, and eaten dry with bread. 222 252

The seed beater is used only in this connection. It is a flat scoop of wickerwork (Fig. 3). The warps are doubled at their midpoints: at 285 412

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285 412 intervals twigs cross these which are bent down the sides of the scoop to the handle, where all the loose ends are bound together. While the specimen at hand has a thong drawing the tip toward the handle, it is probable that this was intended to hold the beater in shape only until the *green twigs dried.*

Garcés records that beside mescal, juniper berries were eaten.[1] 222 252 Piñon nuts, which ripen in October, are parched and ground (without removing the shells); the ground meat is spread on bread. The nuts may also be ground without parching and stirred into boiling water to make a thin gruel.

[285] [412]

Fig. 3 (50.2-1575). A Seed Beater.

263 [222] Wild bees hive in dead logs and the flower stalks of dead mescal. Parties of children go out, picnic fashion, to gather the stalks, split them, and collect the honey. Rock salt (*tôi'i*) is collected from a cave in the [317] cliff on the south side of the Colorado, where there are stalactites of it. This is ground. Much less than we are accustomed to is used.

Hunting

224 [262] Hunting is a man's second occupation, for he relies mainly on his field products. Flesh is part of the dietary the year around, but particularly during the fall and winter when they reside on the plateau. Antelope, mountain sheep, and deer are said to abound in the order named, while cotton-tails, jack-rabbits, and squirrels are plentiful. Hunting in the gorges of the Grand Canyon is really a hazardous enterprise. One instance was recorded of a wounded ram charging his pursuer and hurling him from a narrow ledge. Yet killings are sometimes tame affairs: one man standing at the door of his house shot a mountain sheep but a hundred meters away. They frequently descend the canyon close to the village.

[1] Coues, 344.

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animal at bay. They are bred to furnish good hunters, and castrated.[1] Dogs are called by name; such as *wakwedad*, labia minora (a male dog), *gi'n,ikdwaid*, referring to age, the dog having gray hair, and *ldôa*, *paimôa'* (a brown dog with white patches.) Any dog is called to *'gaiyd*, *sûgd*, *sûgd*, dog, come, come, and driven off with *sa'*, *sdmlgd*, go away.

Preparation of Food

Primitive peoples have more methods of preparing their food than they are commonly credited with. The Havasupai, for instance, have innumerable ways of preparing corn, only a few of which—the result of casual observation—are recorded here.

The grinding slab, on which nearly all wild and cultivated seeds are ground, is roughly rectangular, 80 by 50 cm., by 10 cm. thick. A smaller slab, carried with a moving camp, is 60 by 30 cm. A shallow oval, but nearly rectangular, depression is pecked in one face with a hammerstone. The stone of which they are made is so tough that the process of producing a proper trough is very lengthy: on this account they are highly prized. The mano (*sa'ha'djd'a*) is roughly a prolate spheroid, 17–22 cm. long, with short diameters of 7.5 and 10 cm. The woman sits in front of the slab which rests flat on the ground, with its face slightly tilted toward her. The corn, beans, etc., are first pounded with the end of the mano, and then crushed with a pounding, rocking motion of the stone. The meal is brushed off forward with the side of the hand into a tray basket. The chaff is separated by swinging the basket, throwing its contents into the air, and at the same time blowing off the lighter particles.[2] The clean meal is then replaced on the slab to be pulverized by grinding with an additional slight rocking motion, forward and back, and to a lesser extent sideways. There can be no doubt that the shape of the metate depression and mano among Indians in general is in part the result of the miller's movements. When not in use, the grinding slab is turned upside down with one edge resting on the mano to keep it clear of the ground. A brush is used for cleaning the metate. This is a bundle of mescal leaf fiber, 20 cm. long., bound with a cord for a distance of 4 or 5 cm. at the center.

Stone mortars (*[3]wiqeetu'tiâ*; *[4]wi*, stone, *gue*, something, *tûtiâ*, to pound) are also used for pounding corn, piñon nuts, or dried meat. These measure 15 to 20 cm., with a hollow 10 cm. in diameter. The pestle (*sa'ha'djd'a*, mano) is also stone.

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[1] Dogs are not used for transportation, nor eaten so far as I know. The dogs of sixty years ago are said to resemble those of today, which in turn are in general similar to the North American breeds figured by Allen. Is it possible that they are relatively unmixed and therefore worth study?

[2] Illustrated in Mason, O. T., (k), Plate 100.

[1] [i.e., hunting dogs.—Analyst]

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Seeds of all descriptions are parched not only to roast them, but to dehydrate them somewhat, rendering grinding easier. The kernels of corn, etc., are tumbled about with live coals in the parching tray by a swinging, sinuous, rotary movement. Finally, the lighter charcoal is separated from the grains with the same motion, throwing it up from the far edge of the tray and blowing it away. Any charcoal that remains is picked out.

Cooking is usually done in the clay vessels (*hamdtagwetadlid; hamdt*, clay pot) but boiling (*tuldmîga*) in baskets is carried on at the same time. Small stones, heated red, are dropped, with the aid of a tongs, into a basket filled with water. These are replaced by others when cool. The food is stirred in when the water is boiling; the remaining stones are picked out when it is cooked.[1]

Green willow tongs are used on hot stones, but better wood, such as ash, may be used in tongs for handling hot or prickly objects, stirring stews, etc. Tongs (*adtde'*) are simply green branches, flattened on one side, with a kerf at the midpoint, so that they can be bent double, and bound until dry. They measure 40 to 50 cm. long; a smaller specimen is 20 cm. Crooked sticks and convenient twigs are also used for stirring, as forks, etc. Horn ladles are used in cooking as well as in eating.

A cooking vessel (*mâltâtgwetâtâmia*, cactus, something, boil) is sometimes improvised from the barrel cactus (*mâltât*, possibly *Echinocereus*) when on hunting expeditions. Occasionally the same device is used at home. The spines are burned off, one end cut away, and the pulp removed, so that it can be used for stone-boiling. "Wild cabbage" (*ak'tad*), cornmeal, meat, etc. is cooked in this.

Green corn is usually cut or shelled from the cob and ground to a pulp on the grinding slab. Water is brought nearly to a boil before the corn is slowly added, stirring it into the water with a stick while the pot remains on the fire. When it comes to a boil, it is set aside. Corn is not boiled on the cob as a rule.

Green corn is cut from the cob, mashed, and boiled with unripe pumpkin cut into small chunks.

Squash flowers are boiled until the mass cannot be reduced further,[2] they are then fished out with a twig and mashed to a pulp on the grinding slab. Meanwhile green corn, cut from the cob, is boiling in the liquor. The pulp is then added and the whole is boiled to make a sweet dish.

[1] Food is never cooked in a skin or a pouch.
[2] N. Lumholtz, (c), II, 180.

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171 241 In northern Mexico cultivation has been recorded among several modern tribes: Huichol, Cora, Tepehuano, Tarahumare, Tepecano, and Opata.[1] There are records of the Jumanos in eastern Chihuahua in 1582, the Guaymas, a southern Piman group near the Seri ("land-tillers on a very low scale"), and the Sobaypuris, Pimans on the Rio San Pedro.[2] Intensive agriculture is characteristic of the Pueblos.[3] It would be interesting to know the extent it was followed in such outlying communities as Taos and Picuris. Pima, Maricopa, Yuma, Cocopa, and two groups near the last, Taliguamayque and Cajuenches, Mohave, and Navaho raised crops in abundance.[4] The Havasupai and Papago are agriculturalists to a lesser extent, both subsisting in some degree on wild seeds. But cultivation is greater among them than among the Jicarilla, and Western Apache, Apache-Yuma, Chemehuevi, Shivwits and Kaibab Paiute, and Walapai.[5] These tribes mark the limits of agriculture in the west. It is known not to have extended into California, the Basin, or into the southwestern Plains. In fact for certain tribes in the immediate vicinity of those practising the art we have specific information that it is lacking; to wit, Mimbreños and Tonto Apache, Moapa Paiute, Akwa'ala and Halyikwama of Baja California, and the Seri.[6]

Perhaps irrigation was in all these cases part of the agricultural technique, but it is not recorded. It is the practice of all the Pueblos, the Navaho, Havasupai, Shivwits, Kaibab (?), Pima, Maricopa, and Cora. The Mohave utilization of the overflow of the Colorado corresponds to the planting of other tribes in dry washes or creek bottoms.

175 412 The planting sticks and hoes offer some comparative points. Planting sticks are of two types; one a straight stick having a wedge-shaped point, the other similar but provided with a projecting footrest near the lower end. The first type is that of the Havasupai, Hopi, Pima, and probably Shivwits. The Zuñi use the form with the footrest, while the Navaho use both. The Havasupai hoe is one form of a general type: a flat stick with its blade and handle in one plane, approximating a weaving sword in shape, although there is considerable variation. This type is also used by the Pima, Mohave, Hopi, Navaho, and Zuñi. The last two also use a hoe like our own, a wooden blade or elk scapula set

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[1] Lumholtz, (a), 4; Bandelier, (a), 69, 96, 98; Bartlett, I, 444; Mason, J. A., (d), 135.
[2] Bandelier, (a), 68, 79, 101.
[3] Cushing, (d); Hough, (a), 238, 239, Pl. 19.
[4] Bartlett, II, 172, 180, 214, 222, 260; Pattie, 121, 131-2, 144; Russell, (d), 92-93; *Handbook of American Indians*, I, 859; Whipple, Eybank, and Turner, 139; Kroeber, (a), 776; Leiberman, 288; Francisco Pathers, 304; Lippe, 56; Stephen, 264; Bandelier, (a), 104, 176.
[5] Gifford, 225; *Handbook of American Indians*, I, 698; Whipple, Eybank, and Turner, 139; Curtis, 235; Lewis, (b), 239; Rusby, 67, 68, 74, 75; Whipple, Eybank, and Turner, 22, report agriculture as the main pursuit of the Chemehuevi, but this does not seem likely.
[6] Bartlett, I, 397; Whipple, Eybank and Turner, 14; Kroeber, (b), 479; McGee, 186.

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transversely at the end of a shaft. The Havasupai use a horse scapula but without hafting it.[1] 171 [412]

Cotton is raised by the Hopi, Tewa (except possibly Pecos and Taos), Pima, Maricopa, Western Apache, and Tepehuane. It is not grown by the Navaho, Zuñi, Acoma, or the Tanoan Pueblos.[2] 171 248

Tobacco is widely used in North America though it is not everywhere grown. In the Southwest and the adjacent territories its cultivation has been noted for the Zuñi, Hopi, Navaho, Havasupai, Yavapai, San Carlos, Pima, Southern Diegueño, and the Mayos of Mexico.[3] Smoking is known to have been customary among neighboring tribes, who did not raise the plant: Cocopa, Akwa'ala, Moapa, Cosnino, Paviotso, Washo, Wind River Shoshoni,[4] and generally in California. The Havasupai habit of planting in ashes without turning the soil is also the custom of the Hupa.[5] 171 249

Unfortunately, I do not know which species the common Havasupai tobacco is. Its name, *úva*, however, is connected with Southern Diegueño *op* (*Nicotiana attenuata*), Shasta *ôp*, Takelma *ô"p'*, Crow *ôp* (*N. multivalvis*), Hidatsa *ô'pe* (*N. quadrivalvis*), probably Washo *pinkue*, and possibly Pima *siopal viofâ*, "like tobacco" (*N. trigonophylla*).[6] There is a similar extension of the name "Coyote's tobacco" though again to distinct species; Havasupai (*N. trigonophylla*), Southern Diegueño (*N. attenuata*), and Pima (*N. Bigelovii*). 192 171

Mescal (agave) is gathered and roasted in pits by most, if not all, the non-Pueblo peoples and perhaps by the Pueblo and Mexican tribes as well. It is an item of some importance for the Jicarilla, Mescalero, White Mountain and San Carlos Apache, Navaho, Havasupai, Paiute, Yavapai, Pima, Cahuilla, and Huichol.[7] It would be worth knowing how far this distribution corresponds with that of the plant. Pit roasting is probably absent from the Basin and the Plains, and from California except among the southern desert tribes. But much farther north, in the Plateau and adjacent sections of the Northwest Coast, it is the characteristic mode of preparing roots. The mescal cabbages are probably always pried off with a chisel-edged stick (Havasupai, White Mountain Apache, and Pima) and trimmed with the peculiar hatchet (Havasupai, 171 222 252 [412]

[1] Cushing, (d), Pl. III, 304; Russell, (d), 88, 97; Franciscan Fathers, 285-6. Mohave specimen in the Anthropological Museum, University of California.
[2] Spier, (f), 80.
[3] Hatchell: Curtis (XII, 39) denies that the Hopi plant tobacco; Corbusier, 328; Russell, (d), 110; Spier, (a), 348; Bandelier, (a), 48; Goddard, (e), 358.
[4] Lowie (b), 215; Kroeber, (a), 280.
[5] Goddard, (a), 37.
[6] Lowie, (f), 198. Washo name from Doctor Lowie, 1920.
[7] Goddard, (e), 148-149; Curtis, I, 17-19; Palmer, 647; Corbusier, 327; Russell, (d), 70; Barrows. Lumholtz, (a), 13.

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White Mountain and San Carlos Apache). Like the Havasupai, the Yavapai and White Mountain Apache dry it in large cakes on a layer of sticks and make a concoction of the dried product.

The method of harvesting wild seeds by beating them with a scoop into a basket held in the free hand is characteristic of the Basin tribes and those in adjacent California and Arizona. A woven seed-beater is used by the Kaibab Paiute, Panamint, Paviotso, Gosiute, Ute, Northern Maidu, Klamath, Modoc, Achomawi, Atsugewi, and Cahuilla. The Northern Shoshoni and Salinan substitute tray baskets for these; the Western Apache and sometimes the Salinan a stick. The Yavapai also gather the seeds in the characteristic manner.[1] There are differences in the shape and technique of the beater which would repay investigation.

A number of tribes share a definite procedure prior to a deer hunt which corresponds to the Havasupai meeting at a fire and praying to the sun. The Huichol obtain power from a fire on the evening before the hunt; Luiseño hunters stand in the smoke to be freed of the effects of any breach of social observance. The Maidu meet at a fire to offer to the spirits; the Achomawi and Atsugewi have a ceremony in the evening of the first day of the hunt at which the leader chews roots which he throws toward the mountains. Bourke states that the Paiute and Walapai (but not the Mohave) sing and dance before a deer hunt, but he does not specify the procedure. There is at least a partial analogy in the Western Apache sprinkling pollen and praying to the sun.[2] The Tepecano and Hasinai also have special observances.[3]

The Havasupai also hold continence a prerequisite for success in the hunt. This is true of the Huichol, Paiute, Walapai, Maidu, and is at least suggested by the Luiseño data. It may be general.

I do not know that the deer drive of the Havasupai constitutes a definite type. Driving them into a *cul de sac* or over a cliff may be very common. It has been noted for the Navaho, Yavapai, Maidu, and Gosiute.[4] The chute-and-pound method is widely distributed over the Basin-Plateau and Plains, but is unknown to the Havasupai.

The use of a deer head, or that of an antelope or mountain sheep, as a disguise in stalking is a rather widespread practice. In the west it is recorded among the Mimbreños Apache, Navaho, Zuñi, Hopi, Havasupai,

[1] Powell, 139; Coville, 253; Lowie, (h), 234; Chamberlin, 341; Mason, O. T., (g), 489; Dixon, (a), 188; (c), 212; Barrett, (a), 257; Kroeber, (g), 45; Lowie, (a), 187; Mason, J. A., (a), 120, 143; Bourke, (d), 131; Corbusier, 328.

[2] Lumholtz, (c), II, 40, 41; Sparkman, 199; Dixon, (a), 193; (c), 213; Bourke, (a), 178; (c), 302, 304; (e), 455.

[3] Mason, J. A., (d), 126; Bolton.

[4] Stephen, 357; Franciscan Fathers, 473; Matthews, (d), 239; Corbusier, 328; Dixon, (a), 193; Chamberlin, (b), 235.

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The grinding slab or metate of the Pueblos is also found in Southern California and the Basin. Among the non-Pueblo peoples it is used to some extent by the Pima, Navaho, Havasupai, Yavapai, Mohave,

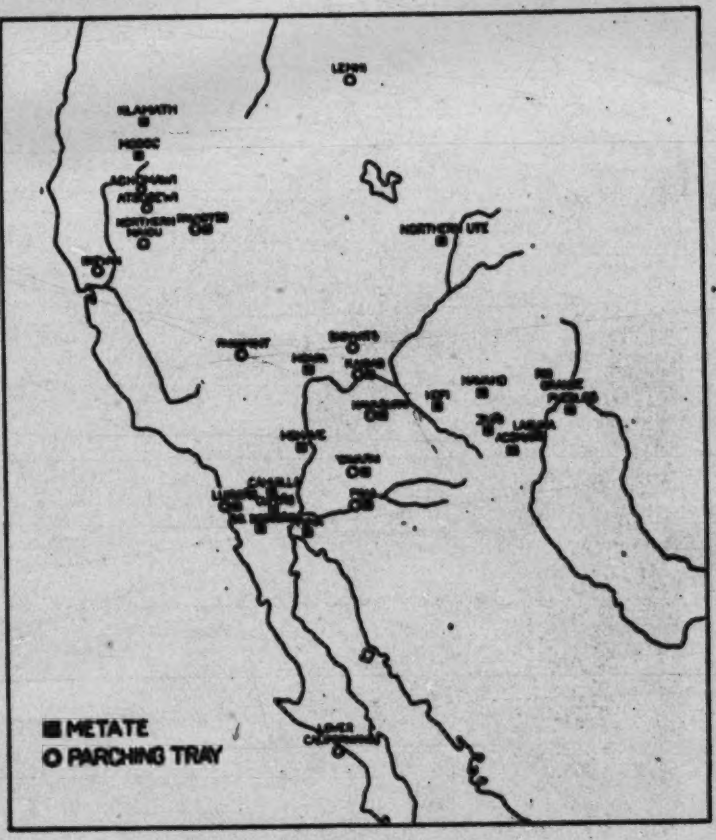

Fig. 5. Distribution of the Metate and Parching Tray.

Kaibab, Moapa, Northern Ute, Paviotso, Klamath, Modoc, Cahuilla, Cupeño, Luiseño, Southern Diegueño, Yuma, and undoubtedly by others in their vicinity.[1] Most of these people, if not all, use stone or wooden

[1] Russell, (d), 99, 103; Hrdlička, (o), 44; Francisca Fathers, 83, 219; Carbonier, 226; *Handbook of American Indians*, I, 931; Powell, 127; Lowie, (i), 304; Barrett (a), 238; Kroeber, (g), 40, 51, 52; Sparkman, 208; Spier, (e), 335; Trippel, 376.

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mortars as well. Mortars are the characteristic utensil of the central Californian tribes and those of the northern Basin.[1] As might have been anticipated from their geographic position some of the western groups apparently favor the use of mortars rather than metates: Pima, Diegueño, Luiseño, and Cahuilla. (Fig. 5.)

Parching seeds by tumbling them about with live coals in a shallow basket is a method widely used among Californian, Basin, and the western ranchería peoples of the Southwest. It is recorded for the Havasupai, Yavapai, Pima, Kaibab and Shivwits Paiute, Panamint, Paviotso, Lemhi Shoshoni, Lower Californians, Luiseño, Patwin, Northern Maidu, Klamath, Achomawi, and Atsugewi. (Fig. 5.) The Pima also cook in this fashion using a shallow pottery vessel. The Lower Californians sometimes substituted a turtle shell. Doubtless many others shared the practice: the Salinan, at least, did not.[2]

Wafer bread is a familiar Pueblo product, probably in use in all the towns, but certainly among the Hopi, Zuñi, and Acoma. It is also prepared by the Havasupai and Navaho but is not known to the Pima.[3]

Fish is not an article of diet of many of the Southwestern ranchería people. This is not altogether a matter of the absence of fish, for they must be at least as abundant as in the Basin where they are eaten. There is a definite taboo ranging from the horror of the Navaho to the mild sentiment of the Havasupai. These tribes include all the Athapascans, (except the Lipan), the Caddoan Taovayoes, the Havasupai, Walapai, Yavapai, and Zuñi. Outside of this restricted area fish are eaten: Cochiti, Lipan, Hasinai, Pima, Cora, Tepecano, Seri, Southern Diegueño, Apache-Yuma, Mohave, Yuma, Cocopa, Washo, and all the Basin Shoshoneans.[4]

With regard to other tabooed animals little can be said because of the fragmentary nature of our information. Lizards are not eaten by the Havasupai, Mohave, Pima, Salinans of San Miguel, the Shoshoneans of Kern River, and the southern Yokuts. But the neighboring Yavapai, Walapai, and Paiute did not despise them, while in California, the northern Yokuts and the Miwok eat most reptiles.[5]

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[1]Cuesta (Chittenden, 289); Mohave (Whipple, 115); Salinan and Yokuts (Mason, J. A., (a), 137–138); Washoe (Stoddard and Fort Hall Paiutes (Lowie, (a), 174).

[2]Carbonell, 336; Powell, 126; Lowie, (i), 234; (k), 136; Coville, 353; Lowie, (a), 174; 188; Bancroft, 360; Sparkman, 193; Powers, 239; Dixon, (a), 160; (c), 212; Kissell, 191. Russell (d), 66; Mason, J. A., (a), 126.

[3]Stevenson, M. C., (b), 361; Cushing, (d), 333; Hodgwick, Ch. II; Franciscan Fathers, 288, 307; Russell, (d), 68.

[4]Goddard, (c), 1st ed., 139; Matthews, (c), 108, 107, 110; Kroeber, (a), 276 277; Dumarest, 146; Carbonell, 336; Russell, (a), 85; Hrdlička, (c), 45; Whittemore, 38; *Handbook of American Indians*, I, 548; Mason, J. A., (c), 340; McGee, 103; Spier, (d), 338; Truppel, 574; Chittenden, 291; Lowie, (i), 203; Mooney, (b), 1030, 1032; Lippe, 42; Stephen, 257; Franciscan Fathers, 214, 307; Matthews, (d), 238; Bolton.

[5]Kroeber, (a), 277; Russell, (d), 83; Mason, J. A., (a), 122; Carbonell, 336.

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281 The hide is hung over a smooth pole, 5 cm. diameter, which rests slanting against a tree. The hide is caught between pole and tree. The hair and pigmented layer are removed with the beaming tool grasped in both hands and drawn down the pole toward the body. The hair is frequently left on the legs, though it is just as convenient to dehair them or cut them off at once. Loose tissue is also removed from the flesh side. The [412] beaming tool is a deer cannon-bone or hip-bone broken lengthwise and sharpened. Now a horse rib, naturally sharp on its concave edge, is

[417]
[291]

Fig. 47. Wringing a Deer Hide.

substituted. Dehairing takes about two hours. The hide is hung on a pole to dry in the sun for a day or so.

When ready for tanning, the stiff skin is soaked in the creek over night, but no longer. It is then rubbed thoroughly pliable in the hands, wetting it with warm water. Folded lengthwise flesh side out, the neck is looped about a post, the legs around a stick, and both are folded back inside the skin. Twisting the stick wrings the skin dry. (Fig. 17.) It is now stretched by pulling at the edges and rubbing it together everywhere [412] until entirely freed of wrinkles. A skewer threaded in little slits which

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281 [412] have been cut along each border of the neck, aids in stretching this tough section of the hide. Excess moisture is scraped off.

281 237 Tan has been previously prepared. Fresh deer brains are roasted and mixed into a ball of yucca fiber. The raw marrow from the spinal canal is mixed into another ball. After being dried on the coals, these will keep indefinitely. The brain is used before the marrow. The brain and marrow of a single deer is ample to tan its hide; half is sufficient, but if the skin is not soft enough, more must be used.

281 One of these balls is worked up in cold water into a soapy liquor. Spraying mouthfuls of this over the hair side, as well as the flesh side at the ends, the skin is rolled up from the neck and tail inward. The legs which protrude from the double roll are wrapped around it to prevent drying out. After being set aside long enough for the tan to soak through, it is spread in the sun, hair side up, to dry somewhat. Now it is straightened, hung over a rail in the sun, and vigorously rubbed and pulled until soft and pliable. The seated tanner catching the skin under his feet stretches it in every direction. Rubbing and working with the fingers creates considerable friction which presumably melts the grease well into the pores. After a second working over the whole surface, it is laid flesh side up to dry in the sun. While rubbing the skin, at which [476] several friends may help, they sing:—

[539]

Wâtim'a wa'a'agadj	ahâwamuhavi
(a hero's name)	he walks up in the water (i.e., the Colorado).

ya'i'vu'i'wîa'

This completes the tanning, which occupies the day. During the whole process care has been taken to prevent the white skin from being soiled, resting it on an old blanket or heap of leaves. Skins are traded while yet [438] a little stiff, i.e., without the final rubbing,* presumably because the fineness of finish depends solely on the amount of labor one wants to expend on it—and this is left to the ultimate consumer.

If it is desired to stretch the skin somewhat, little slits are cut entirely around its edges, and it is buried in damp earth over night, and pegged out in the morning. Moccasins, etc., which stiffen after a wetting, [294] are similarly buried over night and worked pliable in the hands next day.[1]

Mountain lion and deerskins are also tanned with the hair on. The skin is fleshed, after a little water is blown over the flesh side to soften it. (It must never be soaked.) After brain tan is sprayed over the flesh

[171]

[1] The Navaho bury moccasins in the earth to make them pliable (Franciscan Fathers, 308).

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372 obtained from the Hopi. It is braided into a thick cord (*hĕdjdwdcĕnawd*) 30 cm. long, and drawn through a tube (the hind leg bone of a wildcat) of half its length. When wanted the charred end is pulled out of the tube which protects it from dampness. The tinder and stones are wrapped together in their own case.[1]

It is quite as convenient to carry a slow-match (*ohokwidd*) when traveling (Fig. 19). This is a rope of rubbed cedarbark, 2 cm. diameter

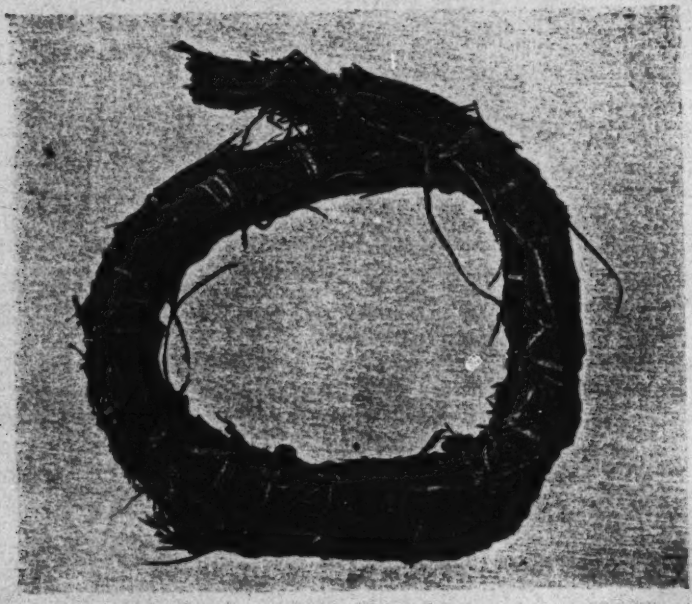

Fig. 19 (50.2–1380). A Slow Match of Cedarbark Rope.

and nearly 2 m. long, tied at short intervals with yucca leaves. It is carried in a coil, the smouldering end being blown on from time to time.

There is no great discrimination among fuels in the canyon for all the available materials are inferior (cottonwood, willow, sagebrush, corn-
[221] cobs, etc.). In fact, this is assigned as one reason for leaving the canyon in the winter; it is certainly too laborious to pack firewood from the
[412] plateau. Fallen trees and dead limbs are broken with heavy stones.

[1] Compare a reed containing charred cotton found by Fewkes near the Verde Valley, (a), 372.

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415 Gourds having an hourglass shape are used as water jugs on foot journeys. They are carried at the middle of the back, held by a rope which passes around the traveler's waist and the constricted portion of the gourd.

Knives. The stone knife (*kwaiyā'l;* also arrowhead) is lanceolate,
324 as large as one's hand, sharp on both edges, somewhat pointed, but with
412 a blunt base. Obsidian is preferable, but flints are used. It is not known whether such knives were hafted; they are no longer made. Another knife (50.2–1219) is a broad flake, with long chips struck from one face only. This is conveniently held between thumb and forefinger.

Cutting movements, as in wood working, are always toward the body.

Stone is not drilled; drilled beads are obtained elsewhere, as among the Hopi. Holes are drilled in wood, bone, or horn (as in the arrow wrench) with an arrowhead, revolving the shaft between the palms.

Sleeping Mats. These (*tcĕkedlakwi'sd*) are made of strips of cedar or
285 juniper bark (*tcĕkedla*) pounded until soft, but not rolled into rope. The larger mats are rectangular, 1 m. by 75 cm., woven with both warp and continuous weft of bark. The ends are bound by stitching with a cord at 2 cm. intervals. Smaller mats are used, and owned, by children. These
[422] are somewhat elliptical, with nearly parallel sides. The warp, coiled from center outward, is crossed by twined wefts (cords) placed radially. Neither blankets nor clothing are made of cedarbark.

Rope. Ropes are usually of yucca fiber, but tanned hide is also used.
283 The inner leaves of a dead broad-leaf yucca are selected, pounded singly between two smooth stones, and flexed with the fingers to remove the connective tissue. The fibers are finally separated by continuing the flexing of a bundle of such leaves rendered pliable with water.

Yucca ropes are three- to six-ply, usually three. These are braided of bundles of fiber; the bundles are never rolled into strands. New lengths are introduced, as required, by simply laying them between two crossing elements. If the fiber is dampened the rope will shrink tight. Three-ply ropes are commonly about four meters long and 1.5 cm. in diameter.

The hide ropes may be of deer, antelope, or mountain sheep skin; the last is strongest.[1] These are also braided of three to six strands. One seven-ply specimen (50.2–1231), nearly six meters long, is flat (0.5 by 1.2 cm.) and the plaiting presents a herring-bone pattern on both sides.

[1]Curiously my informant referred to all articles derived from this animal as best.

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322 is then 3 to 5 cm. through. Shaping proceeds without waiting for the
411 pole to season. A good bow should bear a dark streak (medullary ray?) along its inner face, not on the back: such a bow will not easily break. The pole is cut to the proper length for a bow, six spans (thumb to middle finger), measured three toward each end from the middle. Some bows are only five spans. After the bark is removed, the pole is trimmed to the lines shown in Fig. 22, leaving the back in its natural state. Frequent sighting along the bow keeps the trimming symmetrical. The
[412] cutting is done with a stone knife and finally rubbed smooth with a grit-stone. The width at the grip should be that of two fingers (first and middle fingers lying flat); at the ends one finger wide. Its thickness is not measured. Fiber tension in the green bow gives a marked curve opposite to that when strung. The bow is set aside to season for a month: if it is strung sooner it is likely to acquire a permanent curve. When ready for stringing the nock is cut into the edge at a convenient point. There is no wrapping for a grip, nor are decorative marks or paint applied.

411 Oak is used as well as ash for sinew-backed bows (*mĕsmᵈ*, sinewed?):
322 it is grown in the same way. Mesquite is also used, if it contains a dark
237 streak. The bow resembles the self bow, but it is somewhat shorter, five spans, and only half as thick, although the width is the same. After seasoning for two months or more until it is thoroughly dry, it is ready for the sinew reinforcement. Nocks are first cut. The back is scraped as smooth as possible and fine lines are scratched on it longitudinally,
[412] using a stone flake with a serrated edge. After glue is applied over half the back, a broad sinew is laid on beginning at the middle, stretching it toward the tip. This is rubbed in the same direction with a smooth stick in order to make it adhere. The process is repeated for the other half of the bow, the sinew layers lapping at the middle. Three more layers are similarly added, setting the bow in the sun to dry partially before each application. The sinew extends over the back quite to the inner face. The first two layers are brought over each end and down the face for about 1 cm. The ends of the last two layers are left free, but twisted together. A sinew is bound in the nocks to hold the sinew backing fast. When dry, the grip is bound with a buckskin thong, centering slightly
[439] below the middle. Red cloth, obtained from the Hopi, is passed back
[531] and forth longitudinally through this binding on the inside face, to produce a checkered effect. Red paint is used in default of cloth. The
411 sinew layers part from the wood when the bow is old. This is checked by
237 binding at intervals with sinew. This bow is always kept strung, al-

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other at the forward end. These are hung up to dry.) The sinew is soaked in water over night, scraped with the back of a knife, and separated into fibers when partly dry. To make the bowstring, two bundles of these are rolled together between palm and thigh, new lengths being added by rolling in as needed. Three bundles were preferable; these were rolled together, never braided. The bowstring is tied permanently to the upper end; the hitch for the lower end is shown in Fig. 24a. This is a poor man's style; a rich man would tie a length of buckskin to the loose end and continue the wrapping for another 5 cm., fastening with a half-hitch. To string the bow its upper end is set under the right instep, and while the lower end rests in the left hand, the bow is sprung by pressing with the left knee; then the right hand fastens the string. When strung, the spring of the bow is tried, and a song to the bow and string is chanted: hápúagwlôà (Let this be strong; let this not break).

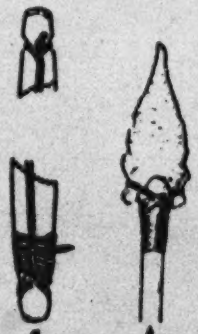

Fig. 24 (30.2-1231, 1233). a, Ties for Bowstring; b, Method of securing Arrowhead to Shaft.

The wrist protector (*saldmí*) is simply a broad band of buckskin encircling the wrist, somewhat trimmed to fit the heel of the hand. It is fastened by taking up the slack in a loop which passes through both ends of the band.

Boys sometimes use small bows of men's type but the normal boy's bow is D-shaped. One in the collection measures 60 cm. from tip to tip, the chord of the arc 25 cm.; another 65 by 25 cm. Boys use only reed arrows, with sharpened foreshafts, and feathered with the plumage of the hawk, flicker, etc.

Reed arrows (*dp'a"dl'a'* or *dl'a"dp'ad'a*; *dp'a"a*, arrow) are most common. Arrow reeds (*dl'd'*) are gathered green. In order to straighten them, the crooked part is pressed on hot ashes placed on a flat stone, or in the groove of an arrow-straightener (*dodóad*). Stones are also heated in the fire for this purpose.[1] The joints are then trimmed. Wooden arrows (*dp'd'a'i'i; i'i*, wood) are made of an especially hard willow (*dwaadld*, probably desert willow). These branches were peeled and left in the sun until partially dry when they could be straightened with a wrench, never by heating. The wrench (*mákwapadjid mádámdid*) is a mountain sheep shoulder blade or horn in which several holes have been drilled.

[1] The shaft is not wet with the tongue at the point to be heated as the White Mountain Apache do.

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been drilled. Straightness is determined by sighting. The arrows are next cut to proper length; for use with the self bow, from tip of forefinger to top of biceps; for the sinew-backed bow, from tip of middle finger to bottom of biceps. (This may apply to wooden arrows only). Reed arrows in the collection measure 75 to 76 cm., of which 15 cm. is foreshaft; willow arrows, 70 to 73 cm.; and boys' reed arrows, 72 to 77 cm. with 9to 12 cm. foreshafts. Willow shafts are trimmed with a knife which like all knife movements is toward the body—and then rubbed between two grooved gritstones (*patamália*) of pumice held in the hand. The shaft is a true cylinder of the diameter of arrow reeds except for a slimmer section where the feathers will be bound and for a flare at the nock. The nock (*padjdtaúigd*) is next cut; in a reed arrow this comes just above a joint. The foreshaft for the reed arrow is also willow, trimmed to size, about 15 to 20 cm. long, and pointed at both ends. After this is painted red, it is glued into the pith channel of the reed. The end of the shaft is then wrapped for 2 to 3 cm. with sinew, fastened with glue, to prevent it splitting. Finally the foreshaft is split to receive the arrowhead, which is wet in the mouth, glued in, and tied on with sinew, which is not, however, glued (Fig. 24b). It is prayed to that it may stay tight. Many arrows, used for small game, have simply a sharpened foreshaft.

Stone arrowheads range from 3 to 6 cm. in length; the smaller are placed on reed arrows, the larger on wooden shafts. These are triangular, with a deep, square notch in the base, and with the cutting edges reaching almost to the base. If an arrowhead tends to work loose, it is nicked well up the side to aid in retying. Stone heads were flaked on the heel of the hand with an antler tip cylinder. Bone or antler arrowheads are not used. Blunt points for stunning small game are not manufactured, but a corncob may be placed on the point of the foreshaft for this purpose.[1]

Willow arrows are often decorated with one to three zigzag or wavy grooves (*dpded'ui'ga*) running the length of the shaft, representing lightning (*vttal'djd*). These are made with a tool consisting of a wooden block with a groove across one face into which there protrudes the point of a knife thrust through from the back. The shaft is drawn through the groove, rocking it slightly, so that the point may trace a sinuous line.

The eagle and hawk furnish the best feathers for arrows, those of a smaller blue and gray hawk and possibly other birds are also used. Young

[1] It is curious that the metal points that are made have the series of rounded shoulders where the tang joins the blade which occur in early trade examples found in eastern United States

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tions) at hand are: Maidu, 1 m., Salinan, 91 cm., Havasupai, 91 to 112, Western Apache, 162, Yavapai, 137, Mohave, 122 to 182, Pima, 135, Cahuilla, 122 to 137, Luiseño, 152, Southern Diegueño, 100 to 120, Cocopa, 182 to 243, Pipi[1] and Lower California Indians, 182, and Pericues, "long."[2] The exception here is the Southern Diegueño.

Mohave, Navaho, and Southern Diegueño bows at least are cut from the wood in the same way as the Havasupai. That is, the rounded back of the bow is the exterior of the tree limb, the interior is cut flat giving a trapezoidal cross-section. This may not be general.[3]

The Navaho use the same bowstring hitches as the Havasupai and also attach a length of buckskin to the string. The bowguard or wrist protector is widely used. In this area it is recorded for the Yavapai, Tonto, Havasupai, Navaho, Hopi, Mohave, Pima, Southern Diegueño, Paviotso, and Northern Shoshoni.[4]

The arrow wrench may be quite widely used. O. T. Mason ascribes it to the Plains Indians, the West Coast tribes, and the Eskimo. I have found it recorded among the Navaho, Ute, and Cheyenne,[5] as well as the Havasupai. This is a mountain sheep horn. The Hopi use antelope or goat horn[6]; the Cheyenne bone also.

Reed arrows are apparently restricted in the Southwest and California to the tribes in the direction of the lower Colorado River. The Yavapai, Tonto, Pima, Cocopa, Pipi, Seri, and the Indians of Baja California seem to use only reed arrows[7]; wooden ones are also used by the Navaho, Havasupai, Western and Mescalero Apache, Mohave, Yuma, Cahuilla, Panamint, Luiseño, Southern Diegueño, and Maidu.[8] All other tribes mentioned in the second paragraph below apparently have wooden arrows only. The Havasupai and Luiseño favor the reed, the Cahuilla the wooden arrow. It is interesting that the Paviotso make a wooden arrow with a separate foreshaft in the manner of a reed arrow.[9]

There is also a suggestion that arrows from the lower Colorado and Baja California are longer than elsewhere. This might be expected from

[1] A group one hundred miles below the mouth of the Gila and below the Cocopa (Pattie, 201).

[2] Dixon, (a), 202; Mason, J. A., (a), 142; Bourke, (b), 57; Whipple, Eurbank, and Turner, 59; Russell, (d), 95; Kroeber, (g), 58; Sparkman, 205; Spier, (e), 350; Chittenden, 204; Bancroft, 362; North, 226.

[3] Pope, 235, Pl. 46, Fig. 2; 237, Pl. 47, Fig. 7; Spier, (e), 350.

[4] Curtis, (a), 283; Smart, 418; Stolpich, (a), 794; Franciscan Fathers, 319; Hough, (e), 244, 298; Whipple, 114; Russell, (d), 163; Spier, (d), 353; Lowie, (i), 245, (a), 192.

[5] Franciscan Fathers, 318; Mason, O. T., (f), 660; Grinnell, (b), I, 179.

[6] Hough, (e), 278.

[7] Whipple, 98; Smart, 418; Russell, (d), 98; Heintzelman, 43; Pattie, 201; McGee, 197, Bancroft, 362; North, 238.

[8] Franciscan Fathers, 182, 318; Mason, O. T., (f), 639, 661; Pattie, 164; Trippel, 576; Kroeber, (g), 58; Coville, 360; Sparkman, 205, 206; Spier, (e), 351; Dixon, (a), 203.

[9] Lowie, (i), 246.

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with the exception of the top. It is decorated with a band of indifferently colored porcupine quills similar to that placed on moccasins. A headband or a squirrel skin cap is added to confine the hair. One such band (50.2–126) is made of a strip of deer legskin, with the ends sewed with a running stitch. (The sinew, as in all sewing, is prevented from pulling out by a simple knot in each end.)

Women's hair is banged below the eyebrows to the outside of the eyes and at the sides and back to the shoulders or a little below. When rather long it tends to fall in front of the face; it is then brushed back, not over the shoulders, but so that it can be caught under the chin. Or the locks above the ears are tied together at the occiput, enclosing those at the temples.[1] Girls' hair is dressed like that of their mothers. Cushing observed that the small boy's hair was cut short except for a long tuft on top, "like the crest of a quail."

Feathers are, perhaps, worn only on gala occasions; their function, when worn at dances, by men and women, is to cause the rain to fall. Only eagle feathers are used and the down is preferred to the plumes. The typical decoration is a bunch of down, 20 to 25 cm. long, pendent in the back from a cord, 10 to 15 cm. in length, tied to the top of the head. (The cord, lapping the quill, is bound to it with a wrapping of sinew.) Plumes are also stuck upright in the headband at the right temple. One specimen (50.2–1628) consists of two plumes 37 cm. long, placed side by side, and held in place by a sinew lashing and a peg piercing both. Two small downy feathers are lashed to the shaft of each at its tip.

Often a comb of long splints, beautifully plaited together with colored threads, is thrust into the headband, to which two eagle plumes, either white or red, are attached by cords, so as to float about in the wind.[2]

Fig. 46 (50.2–1894). A Mescal Fiber Hairbrush bound with buckskin.

The hairbrush (*tcī'ī*, any brush) is a bundle of stiff fibers from mescal leaves, folded in two, and bound with buckskin halfway to the free ends. A cap of buckskin or cloth is stuck over the butt with piñon pitch and tied about with a thong. A new brush is 11 to 13 cm. long by 2 to 4 cm. in diameter (Fig. 46). As the fibers break off in use, the end is evened by burning. The principal use of brushes is by women; men, as a

[1] It is not held in the mouth in the manner of the White Mountain Apache.
[2] Cushing, (a), 848.

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171 302 Plains hair dress is affected to the east. Mescalero, Taos, Picuris, Southern Ute, and Northern Shoshoni men wear their hair in braids, sometimes wrapping them with strips of fur. This was apparently the earlier Navaho style. It is, on the contrary, of recent introduction among the Northern Shoshoni, who in earlier times wore the hair loose and parted in the middle in the manner of the Wind River Shoshoni.[1]

The case is simpler with regard to women's hairdress. Apparently throughout the Basin and among most of the rancheria peoples of the Southwest women wore their hair loose. In Arizona it was usually cut straight across the forehead to form a low bang and in the back at the level of the shoulders (Havasupai, Walapai, Yavapai, San Carlos Apache, and some Mohave). Pima, Maricopa, and Yuma followed the same style, but the back hair may have been somewhat longer, hanging even to the middle of the back. The Southern Diegueño add only braids at the temples.[2] Aside from these, Plains influence has apparently affected the Lemhi and Wind River Shoshoni and the Southern Ute, who part the hair in the middle though they do not braid it. The older Pueblo style of two whorls of hair on the side of the head, described by Castañeda for the Zuñi, is perpetuated only by Hopi maidens. The older women in those pueblos wear two short braids. Elsewhere, the hair is banged in front and cut square just below the ears in back, but at Zuñi at least the hair is parted from ear to ear over the crown of the head and the rear portion tied in a queue. Navaho women, like the men, draw the hair straight back and club it behind. The Achomawi and Atsugewi wear it in two braids wrapped with minkskin in front of the shoulders. Illustrations of a Cocopa and some Mohave show it hanging loose about the shoulders from a central part.[3]

171 [301] A feather hair ornament consisting of a bunch of down pendent from the top of the head by a short cord is worn by the Havasupai, Yavapai,[4] and by Zuñi dancers. It may be more generally distributed in the Southwest.

● [412] A brush of stiff fibers similar to the Havasupai hairbrush is made by the Pima and Huichol.[5]

[301] Ear pendants worn by Yavapai of both sexes are quite similar to those of the Havasupai: strings of beads, five to six inches long, with mother-of-pearl or stone pendants.[6]

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[1] Pattie, 164; Goddard, (c), 2nd ed., 84; Lowie, (i), 216, 217; (a), 188; Franciscan Fathers, 99. For a western group see Dixon, (c), 210.
[2] *Handbook of American Indians*, I, 838; Bartlett, II, 229.
[3] *Handbook of American Indians*, I, 220, 620; Stevenson, M. C., (b), 271.
[4] Corbusier, 360.
[5] Russell, (d), 116; Kissell, 145; Lumholtz, (c), II, 232.
[6] Corbusier, 360, 362.

241 Their garden was lush with corn, beans, pumpkins, watermelons and sunflowers that grew large seed heads. Purple figs and red-cheeked peaches grew at one end of the plot.

Chickapanyegi worked unhurriedly, pushing the dirt aside with his bare toes to open the floodgates, letting the water gush through to fill the ditches that ran between his rows of vegetables. Toes did the work of fingers, opening ditches or packing the soil to close them, picking up sticks and stones and piling them ready to be removed. Here was a way of life new to me and very intriguing.

060 The Walapai that I knew lived in idleness on bare sand, accepting government rations, a few working at odd jobs. These people produced and stored food, not only for the immediate future, but for years ahead. At one time, the Walapai, too, had been self-supporting and self-sufficient; then agents of the government had come, using rations as a buying power, and had established controls that crushed initiative.

241 412 The Havasupai had devised their own garden tools, even making a spade by fashioning the blade and handle from a long, flat piece of wood. They used the shoulder blades of horses or anything they could get that would loosen the soil or chop weeds. Obviously they were greatly handicapped by these primitive tools; sticks, bones and toes were poor substitutes for spades, hoes and rakes. The Indians themselves restricted production by refusing to till inherited land until it had lain fallow for a year or more. The spirit of the dead might at any time return to its former home, so they would not make immediate use of such land, partly through fear, but also to show respect to the former owner. Thus many acres of fertile soil lay fallow, necessitating more intensive cultivation of the land in use.

241 Tending their crops and preserving their food was the main object in life for the people of this village. Always the crop was divided into portions: some for eating, some held for an emergency, but the best kept for seed.

342 674 Chickapanyegi's rectangular house stood near his garden. The flat, brush-covered roof, topped with earth, and the sides, thatched

2:Iliff Y-5 (ca. 1901) 1954 NT14 Plateau Tumam NT14
Havasupai

While Eastern construction workers were harnessing Mooney Falls, this load of alfalfa would have brought the woman five dollars

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Mescal trimmed for the roasting pit. Stick is used to pry plant from the ground. Hatchet-like knife is used in trimming

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American Museum of Natural History

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2:Illiff Y-5 (ca.1901) 1954 NT14 Plateau Yumans NT14
Havasupai

rigating purposes and an abundant crop is assured him. The almost perpendicular walls of the canyon, which he has made his home, are lined with storehouses which in the autumn he fills with corn, beans, and other products of his labor.

The most discouraging feature at present to the Havasupai is the fact that many of them have no farming implements. The farmer often loans them plows and hoes, which are always promptly returned. When unable to borrow implements, they laboriously loosen the soil with sticks. If farming implements were furnished them, they could easily cultivate all the land to which they have access. Much labor and time would thus be saved, and what is still more important, their surplus products thus gained could be marketed, which would enable them to provide themselves with warm clothing for the winter months.

All of the Indians of this tribe dress in part in citizens' clothes, and most of them are quite willing to adopt the ways of the white man. They depend very little on the professed abilities of the medicine man. . . . As they come in contact with very few white people, except those employed at the school, very few of them speak enough English to make themselves understood.

Havasupai Day School—This school has a capacity of 46, but has been crowded beyond its proper limit, having an average attendance of 71.

We have a good stone school building, but it is not large enough to accommodate the school. The pupils' lunch is served under a cottonwood tree, which fails to protect them from the heavy summer rains we are now having. . . . As there is an abundance of stone in the canyon it would cost but little to build a dining room with a wareroom attached, where the supplies could be safely stored.

Work in the laundry and sewing room is ably conducted. Both boys and girls are detailed to assist in cooking the noonday lunch, and, under the supervision of the cook, do excellent work.

I trust that either 20 of the largest boys and girls will be transferred to the Truxton Canyon Training School when it opens September 1, or a kindergarten department will be added to this school, as it is impossible for one teacher to instruct 71 pupils in a creditable manner.

Permit me to express my appreciation of your support and encouragement.

Very respectfully,

FLORA J. GREGG, *Superintendent*

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Fig. 23. Women grinding corn. A. Edith Pilsbury prepares ground corn for baking white type of bread. B. Mamie Chick grinds dried and parched corn.

THE HAVASUPAI

sils, and blankets is owned individually. Each one can dispose of his possessions independently. 422

The Havasupai is an excellent horseman and packer. He usually has quite a number of horses and does considerable packing on the trail with them. Traveling up and down the steep winding trail to the top of the canyon is very strenous work for the horses and the Indian must have a sufficient number of them so as to rest each horse for a few days after one of the trips. 492

When first visited by the white man these people dug holes with stone hoes, planted their seeds, but did little cultivating. Only a small acreage was planted, this being irrigated from small ditches running from dams of rock, logs, and willows piled in the river. Methods of farming are still simple. The ground is first plowed and then cultivation is done with a hoe; some rotation of crops is practiced from year to year. Irrigation ditches now serve over a hundred acres of land. 241 [215]

The Havasupai are among the most conscientious farmers in the Southwest. Their interest centers so firmly in their fields that when remunerative employment is to be had at Grand Canyon the men will leave the work with semi-monthly pay to plant and tend their crops. Planting begins in the middle of April, but previously the fields are cleared of weeds and brush, plowed with a one horse walking plow, and irrigated two or three days before planting. [144]

The tools used are a planting stick about an inch wide and a foot and a half long with one end cut wedge-shaped, and a modern hoe with a blade at an angle to the handle. Formerly a wooden spade-shaped hoe with an extra long handle was used; also, the shoulder blade of a horse was held in the hands and used to scrape the sand out of irrigating ditches and for scraping out weeds. 241 412 [237]

Planting is an occupation that most of the family takes part in; even the small children help dig holes. The corn is not planted deep, about three and one-half inches is the usual depth. The lines for the rows of hills are generally drawn with the foot. Kneeling, the first hole is dug with the planting stick; the soil is loosened, and eight or ten seeds dropped in. However, before putting the kernels in the first hole the planter says a prayer. Filling the hole, he takes two or three short steps forward, kneels, digs a second hole, and plants. This he continues until the field is planted. 241

The planting is not all done at one time but extends over a period of two months. Beans are planted on the same day as corn and placed half way between the corn hills. Both crops ripen about the same time.

When the young corn shoots are about two inches above the ground, they are given a second watering. When the tassels appear, about two and a half months after planting, the corn receives a third and last watering. The fields are weeded at regular intervals and traps are placed for rodents which would otherwise destroy a portion of the crops.

The Havasupai plant a small variety of corn, with ears about six inches long, known as Mohave corn, which will yield ears in about two months. Other varieties ripen at intervals from mid-August until the last of September. When the ears are ripe, they are gathered in burden baskets. The gatherer breaks off the ears and throws them in the basket on his back while he walks along. The corn is dried on the roofs or on brush heaps. It may be placed in the storage chambers either in the form of husked ears or shelled and piled in a corner. Seed corn is always husked and heaped in a separate pile in a corner. Watermelon, pumpkin, sunflower, and squash seeds are dried, put in cloth sacks and stored in the storage chambers. Beans and corn ripen at the same time and those beans not eaten green are dried and stored in stone chambers for winter use. [137] 251

The Havasupai have innumerable ways of preparing corn. Only 252

343 plaster. Marks were made on each seal so that the owner could
423 readily identify it. These high storage chambers always kept the Indians' food supply safe from the floods that rushed down the canyon at times. The summer climate in Cataract Canyon is very hot. The rock
193 walls absorb the heat of the sun during the day and only a part of this stored heat is radiated during the night.

252 Most of the tribe live much of the time out-of-doors. The cooking is done over an open fire and the other household work is performed un-
132 der trees and brush shelters. In winter the sun lingers only six or
361 seven hours between the cliffs, imparting but little heat, and the nights and mornings are very cold. Because of this and lack of fuel, most of the tribe leave the canyon during the winter months and live on the plateau around the head of Topocobya Trail on the east. Here there is plenty of pine wood for fuel and good grazing for the horses. On the
343 plateau, the house is a sort of hogan of logs and earth, more solid in construction than in the canyon.

264 In the summer most of the cooking is done out-of-doors and the
355 meals are served there also. The cooking pots and pans, baskets of fruit, trays of bread, water bottles, and coffee pot are placed together on the ground. A large vessel containing ground rock salt always
265 stands nearby, but very little is used, and practically none at all in the process of preparing food. The family groups itself about these, sitting on the ground or on boxes within easy reach of the main dish of the meal. Sometimes plates and spoons are used, but usually pieces of meat and vegetables are fished from the stews with the fingers, twigs, or knives, while mush is scooped up with chunks of bread. Generally the women and children eat with the men, but when they are visiting male relatives or friends they usually wait until the men are through.

252 Cooking utensils are of the simplest kind—cheap tin kettles, lard
415 cans, and tin buckets. Some characteristic Indian utensils are still in
388 use. A shallow basket woven of willow splints, lined with a coating which may be red clay, stewed peaches or other sticky substance, is used for roasting piñon nuts and corn. Hot coals are put in the baskets and shaken around until the nuts or corn are roasted.

227 The conical shoulder-hung basket is still in use for gathering vege-
252 tables and fruit. The *metate* stone for grinding wheat, corn, acorns,
412 and piñon nuts is extensively used. The *metate* is a flat slab of hard stone (the *mano*) held in the hands. When not in use the *metate* is turned upside down with one edge resting on the *mano* to keep it off the ground. A brush made of mescal leaf fibre is used for cleaning the *metate*. Stone mortars, and pestles, are used for pounding dried meat, piñon nuts and corn, also.

177 The Havasupai have adopted the white man's mode of dress. The
291 men wear overalls or corduroy trousers, blue cotton shirts, jumpers
302 large cowboy hats, and boots or shoes. Their hair is cut short. The women wear long, wide-skirted dresses, which they make themselves, of calico and print in the brightest colors obtainable. Ten yards is the usual amount of material required to make a dress. The hair hangs down in long bangs over the forehead so it almost obscures the eyes. It is cut shoulder length in back. Their hair dressing is about the only thing distinctly Indian unless it is the brightly-colored handkerchief tied loosely about the shoulders. Shoes are of American manufacture, a high top, low heel lace shoe for the older women and oxfords for the girls and young women. Moccasins are sometimes worn by the older men and women. During the warm weather the women and children go barefoot around camp.

291 Formerly both men and women wore moccasins. The man's moccasin consisted of two pieces. The sole was made of the thickest part

stream into ditches with a speed of flow sufficient to divert a considerable amount of water. It is then carried through the village and into the fields. Most of the irrigation canals are simply small ditches dug in the sand, banked slightly on the sides. The main ditches are as much as two feet deep and three feet wide, but the laterals are much smaller. These are dug from the main ditches to the individual garden plots which may then be watered as necessary. Each field is divided by long mounds of earth into sections which are watered one at a time by letting the excess from one into the next until the entire field is well soaked. Whenever the water must be carried across the mouths of side canyons where ditches would be frequently washed out in storms, small aqueducts have been constructed with piping and cement. The Indian Service has made plans to install new diversion dams and three new aqueducts with permanent footings at a cost of many thousands of dollars. The old system is a primitive one, but it has stood the test of time, for the Havasupais have been irrigating for centuries. 312 241 312

In preparing the fields for the first planting in April, the old buckthorn planting stick as an agricultural tool has given way to the plow, scraper, harrow and disc as well as shovels and hoes. Most of this equipment, along with several cultivators, mowers and one tractor, belongs to the Tribal Council which rents it out for services or money. Unfortunately, most of these tools are badly cared for since the Havasupais seem to have little mechanical ability. Men, women and children plant, but the men do most of the field preparation, irrigation and fence building and repair. The age old prayer at the first planting is still a very important part of this spring activity. 241 [412] [177] [655] [462] [782]

The more than 280 Havasupais speak a dialect which, along with that spoken by the Walapais, the Yavapais and the Tonto, has been classified as the eastern division of the Yuman stock. Havasupai and Walapai are particularly close, the dialects being no more different from each other than are "Bostonian" and "Brooklynese." The cultural affinities of these two groups are equally close and their members live comfortably in each other's midst and frequently intermarry. 197 [101]

Physically the Havasupais bear a close resemblance to the Indians of the Lower Colorado. They are of medium to short stature and inclined to fatness. Their complexions are relatively light and they smile easily and WINNINGLY. 142

304 in the pulling out of the beard, although
302 whiskers are sometimes permitted to grow in front of the ears; beside occasional mustaches, faint goatees are affected by the young. Scarifications, for ornaments, are not unknown.

515 The women, both old and young, are remarkably careless of personal cleanliness and appearance, nor are the older men superior to them with reference to cleanliness. The young men, however, are noticeably neat in the care of their persons, frequently bathing in the river, and careful of their toilet and dress.

241 I have mentioned the things which are cultivated by the Ha-va-su-pai. On these, as on various roots, wild plants, and fruits, they depend for their vege-
252 table food. Green corn is variously
262 prepared: it is roasted, or boiled in the ear; or cut up and cooked with beans, bits of deer suet, etc., it forms the succotash of the more eastern tribes, and
[412] of historic celebrity. Crushed on a metlatl with a little flat grinding-stone or muller, together with green squashes, so as to form a pulp, it is then boiled, when it becomes gelatinous, resembling the *poi* of the Sandwich Islanders. Like it, also, it is eaten with the two fingers. Sunflower seeds, toasted by being shaken together with live coals in an earth-covered basket tray, then ground, formed into patty-cakes, and slightly baked in the ashes, are eaten as a relish with these and other dishes, in the absence of meat. Indeed, this curious sunflower food takes the place, to a great extent, of meat during the summer months.

251 The corn, while still green, is sometimes prepared for storage, by being roasted, husks and all, in hot sand, while the ripened corn is merely dried on the ear. Food is made of the latter, either
252 by simply parching, or by grinding into meal. The meal, coarse or fine, is then used for samps, mushes, or batters, and cakes, thick or thin, and of many varieties and degrees of wholesomeness.
[262] Melons, pumpkins, peaches, and apricots

[P.549 A]

262 tion variously, — by roasting, broiling, frying, baking, boiling, or drying. No part of the animal is wasted; blood, intestines, even visceral glands and organs, as well as the half-digested vegetable matter from the stomachs of the deer, antelope, and rabbit, being utilized as food. The liver is frequently eaten raw, immediately on the death of the animal.

412 Their implements for preparing food are few. The muller, or rubbing-stone, and the metlatl, or mill, of sandstone or volcanic rock, and various in size, flat transversely, and concave from end to end, placed upon a skin, are used for grinding; while large, round, closely-woven trays of basket work, coated with mineral asphaltum and earth, make excellent roasting pans. Earthen pots and [439] brass kettles, procured by barter with 415] the Moquis, serve as cooking vessels. Moqui bowls and native baskets are used in serving food, which is dipped [264] from the cooking pot with large ladles of horn or wood, and eaten either with the fingers, flat sticks, or little wooden 415 and horn spoons. Large panniers, slung over the forehead or shoulders with a 482 broad strap of raw-hide, are used in collecting food, or carrying it to and from the distant granaries; and certain huge, small-necked, round-bottomed basket bottles serve as canteens and water-jars. 412 Knives of band-iron, occasionally of good [177] steel, have displaced, save in rare instances, the original flint instruments, as have also chisel-shaped fragments of iron or steel, inserted into wooden handles, like primitive stone axes, supplanted the scarcely ruder prehistoric implement. Sharpened bone or hard-wood splints and bits of stray wire make awls and needles; and sharp bone, or chipped discs of rock, their skin-dressers. Various stone hammers and mauls, with flat stones used about the fire, complete the limited yet all-sufficient list of Ha-va-su-pai household appliances.

In their agricultural operations and in the excavation of mescal pits, rude hoes,

412 spades, and picks, of wood, bone, horn, or iron, — the last procured by trade, — are used, as well as the universal *kō-ta*, or digging stick. In planting, the long [241] prod or spud of cedar is used, a convenient branch being left short near the lower end, with which the implement is pressed down with the left foot.

492 Within the past few years the introduction of horses among the Ha-va-su-[177] paí has necessitated rude saddles, bridles, whips, spurs, lassos, and hobbles. Among these things, only the bridles and spurs sometimes differ from those of other Southwestern Indians. An efficient though extremely primitive bridle is made of a little hard-wood stick, a small strap of buckskin being attached to either end of it, and passed tightly under the chin of the animal; and two long thongs of light material serve as reins. Equally primitive is the spur. It is made from a fork of some hard, elastic wood, the stems of which are fastened to either side of the foot, and the base sharpened into a sort of prod.

411 Their weapons in war and chase are rude, knotty clubs of hard wood; pikes about four feet long, of the same material, sharpened and hardened at the point in the fire; beautifully finished bows and arrows, both wooden and iron tipped, and somewhat longer than those in use among the Pueblos. Slings were [526] formerly used, although now only to a limited extent, being principally seen as toys or playthings of the children. It seems almost paradoxical that the Ha-va-su-paí — least acquainted with civili-[177] zation perhaps, of any Indians in the United States — should universally possess repeating rifles of the most improved models and an abundance of ammunition. Destructive alike of life on the one hand, and of primitive defensive usages, on the other, the gun has not, however, displaced the ruder weapons which I have described.

611 A most curious fact, and a very sig-614 nificant one in the consideration of the

ward glance at his own threadbare soldier coat and well-patched breeches.] I am young [he was nearly fifty], but am I not old enough to remember how my people dug the soil with wooden hoes, or cut the poles of their cabins with stone axes, and skinned the deer with a knife of flint? No; I take the father of the Land of Sunrise [Washington] by the hand, and my father of the Land of Sunset [General Wilcox] do I grasp by the hand, that we may look one upon another with smiling faces."

The worship of the Ha-va-su-paí consists of prayers, made during their smokes, or at the hunting shrines, which are merely groups of rude pictographs along nooks or caves in the walls of the cañon. Here, seated on the ground, the worshiper blows smoke to the north, west, south, and east, upward and downward; then says, in a low tone, some simple prayer, only one of which, addressed to the spirit of the Deer-god, I was able to record: —

"Let it rain, that grass may grow for the deer.
Go not away, O deer, from my arrows and weapons.
Thou art ours; by thee do we live.
Go not away, but remain to minister to our wants, to accept of my sacrifices."

The Ha-va-su-paí believes that the source of his river is sacred and pure; that polluted by the touch of man it would cease to give forth its waters, and the rocks of the cañon would close forever together.

Ko-hót told me, one morning, the following beautiful story of the origin and history of his nation: —

"When the world was new it was covered with waters, save where a single mountain peak to the north looked out above their surface. Here, alone, wandered the great Coyote. Mankind lived in the four dark cave-plains of earth, below this mountain, until, under the guidance of a great cacique, they journeyed up from one to the other, and were finally led out into the light of the